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EADS SOLID DISCHARGE DATA SYSTEM
1982 ANNUAL REPORT

by

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16. ABSTRACT The report is the first data summary of solids media sampling and analysis results compiled in EPA's Solid Discharge Data System (SDDS). SDDS is a component of a group of related computerized data bases -- the Environmental Assessment Data Systems (EADS) -- that describe multimedia discharges from energy systems and industrial processes. EADS was designed to aid researchers in environmental assessment, source characterization, and control technology development. The report summarizes data compiled from the implementation of SDDS in 1980 through 1982. It lists sources reported in SDDS, feed materials used, chemical analysis data on hazardous and priority pollutants, and the number of samples for each source.

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Pollution	Pollution Control	13B
Information Systems	Stationary Sources	09B, 05B
Wastes	Solid Discharge Data System (SDDS)	14G
Sampling		14B
Analyzing	Environmental Assessment	
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NOTICE

This document has been reviewed in accordance with U.S. Environmental Protection Agency policy and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

ABSTRACT

This report is the first data summary of solids media sampling and analysis results compiled in the Solid Discharge Data System (SDDS). The SDDS is a component of a group of interrelated computerized data bases named the Environmental Assessment Data Systems (EADS) which describe multimedia discharges from energy systems and industrial processes. The EADS was designed to aid researchers in environmental assessment, source characterization, and control technology development. This report summarizes the data compilation from the implementation of the SDDS in 1980 through 1982. It lists the sources reported in the SDDS, feed materials used, chemical analysis data on hazardous and priority pollutants, and the number of samples for each sources.

CONTENTS

Abstract ii

1. Introduction 1
2. Description of the SDDS Data Base. 6
   - Data base differences 6
   - SDDS design 7
   - Data base structure 9
3. Data Summary 15
   - SDDS sources summary. 15
   - Chemical data summary 17

References 20

Appendices

A. Environmental Assessment Data Systems multimedia report for SDDS A-1
B. Solid Discharge Data System test series source summary . . B-1

FIGURES

Number		Page
1	Components of the Environmental Assessment Data Systems	2
2	EADS/SDDS organization	8
3	SDDS structure	10

TABLES

Number		Page
1	Environmental Assessment Data Systems Source Category Summary	16
2	Environmental Assessment Data Systems Chemical Statistics Report (Water Priority)	18
3	Environmental Assessment Data Systems Chemical Statistics Report (Hazardous Wastes)	19

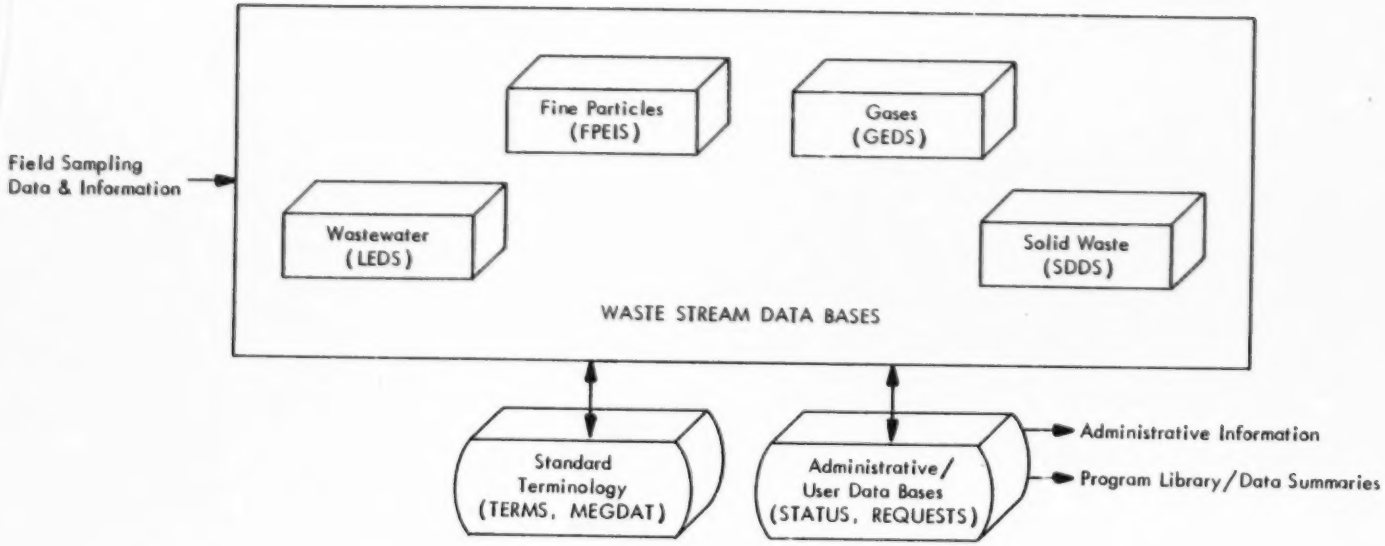
SECTION 1

INTRODUCTION

The Solid Discharge Data System (SDDS) is a computerized information system that contains the results of sampling and analysis activities performed on solid media discharges from energy systems and industrial processes. The SDDS is one of four waste stream data bases which make up the Environmental Assessment Data Systems (EADS).[1] The SDDS became operational in June 1980. This annual report describes the SDDS and its growth, contents, and future within the EADS.

The EADS is a comprehensive system of computerized data bases that describe energy systems, industrial processes, control technologies, and process discharges. Moreover, the EADS is a protocol for data analysis and evaluation that allows users to make consistent and meaningful interpretations of the data collected and reported. The EADS protocol may be applied to any type of sampling and analysis activity in which discrete samples are collected.

The EADS is composed of four operational data bases for multimedia product, process, or waste streams sampled and analyzed, that are supported by a variety of reference data bases and data evaluation programs. This is shown in Figure 1. The four sampling and analysis data bases now in operation are the Fine Particle Emissions Information System (FPEIS), the Gaseous Emissions Data System (GEDS), the Liquid Effluents Data System (LEDS), and the Solid Discharge Data System (SDDS).



SDDS - Solid Discharge Data System
FPEIS - Fine Particle Emissions Information System
GEDS - Gaseous Emissions Data System
LEDS - Liquid Effluents Data System

STATUS - Status of each test series
TERMS - Standardized terminology documentation
MEGDAT - Multi-Media Environmental Goals Data
REQUEST - User Report Documentation

Figure 1. Components of the Environmental Assessment Data Systems.

Each data base contains extensive information on the source of the discharges, on applied control technologies, on fuels or feedstocks, and on the composition of each discharge. The EADS is applicable to most sources, including industrial processes, energy systems, and wastewater treatment plants. The structure of the EADS and the types of data contained in the EADS are discussed in Section 2.

The vast and growing volume of sampling and analysis data produced by EPA, its contractors, and other agencies required a mechanism to consolidate such data. These organizations have produced and still are producing a broad range of data from a variety of industrial and energy sources, and sampling and analysis methods and protocols are constantly evolving. The EADS was created to provide a comprehensive and diverse repository for multimedia environmental sampling and analysis data and to consolidate the data in a central location where they can be readily available to the user community. To meet this provision, the EADS was designed to accommodate a variety of multimedia data from assorted sampling and analysis programs.

One of the requirements of an environmental data base was that a consistent format be used in order to facilitate accurate reliable data assessments. More specifically, it was essential that data be reported in similar units and be compiled with consistency in engineering conditions, technical bases, etc. To meet this need, the EADS was developed to provide a standardized and uniform protocol for reporting sampling and analysis data.

A critical need existed for current information and standardized data analysis procedures. Thus, the EADS was created to supply current sampling and analysis data for evaluation and to provide standard methods for the retrieval and analysis of the data. The LEDS, for example, has been useful to the Office of Research and Development in the development of the Wastewater Treatability Manual. The EADS is constantly being updated and expanded, and there is a Program Library to aid users in their data evaluation needs through the utilization of standard reports and analysis software.

Finally, and possibly most important, the EADS was created to document the quality of the data reported. EPA is committed to producing environmental data of high quality and to providing a cost-effective means for documenting the results of sampling and analysis programs so that data quality may be determined. The EADS is an integral component of IERL/RTP's approved Quality Assurance (QA) Program Plan and contains specific QA parameters to aid interpretation of the data by the user. The broad applicability and comprehensiveness of the EADS make it particularly suitable for a QA documentation role.

Data from the EADS have been used to model process engineering emissions, to design and evaluate control technology, and for many other applications. Because of the sensitive nature of some stationary source emissions data, EADS provides a special feature which is designed to protect confidential or proprietary source data. If this feature is utilized, EPA will have no knowledge whatsoever of the identity of the source. This feature enables the EADS to obtain, store, and use multimedia emissions data that would otherwise be unavailable. Confidentiality has already been used extensively and has been a great aid in obtaining data which probably would not have been available otherwise.

The EADS is designed as a user-oriented system. An SDDS User Guide[2] is available documenting instructions for data encoding and submittal, along with methods for data retrieval. Use of the SDDS data system and analysis software is described in the SDDS User Guide. Revisions to the documentation are made easily, and supplements are issued as needed.

The EADS Program Library contains an extensive array of user programs, including special reports and computations. Data can be retrieved according to source control technology, sample methods, or other criteria. Data can be requested for the entire EADS or for any of the data bases within the EADS. Specially designed routines are available to interface with statistical packages and to present the data in a variety of reporting formats. For example, the FPEIS data base has a program called PArticle Data REduction (PADRE), which calculates particle distributions from user supplied stage

weights/concentrations and cut diameters, and stores the results in the FPEIS. These programs are designed to assist the user in obtaining useful and meaningful data in a variety of forms.

The EADS is available at EPA's National Computer Center (NCC) at Research Triangle Park, North Carolina, on the UNIVAC U-1100 computer. The EADS can be accessed directly on the computer by any user who meets the accounting requirements of the NCC or by written or verbal request to the EADS technical support staff.

A key component of the design effort for the EADS data bases is flexibility. User needs will change, and the EADS is capable of adapting to these changes in order to remain a useful information resource. The EADS has undergone several improvements since it became operational in 1980 and will undergo additional changes as needed. The EADS is still the only sampling and analysis and engineering data system available today that is completely integrated across media boundaries.

SECTION 2

DESCRIPTION OF THE SDDS DATA BASE

The SDDS data base contains industrial or energy process source emissions test data and related source and control system design and operating data. It describes the solid discharges at the point where the solid sample is collected from the discharge stream. This is accomplished through a flexible data base structure and in the definitions of the principal data types that are reported. Such data types are defined as data elements, each data element describing a particular piece of information, such as a source characteristic, discharge stream characteristic, control device or treatment process, source operation, test information, analyses of the fuels and feedstocks, sampling activity information, chemical analyses, radionuclide analysis, or bioassay result. The data elements collectively describe the entire source test activity. The SDDS may contain more than 500 discrete data elements for each site test activity reported. The extent (or completeness) of the data contained in the data base depends on the objectives of the specific site test plan.

DATA BASE DIFFERENCES

Before the SDDS is described in detail, it should be noted that the four waste stream data bases (FPEIS, GEDS, LEDS, and SDDS) have the same structure, but due to differences in media, the data elements are not always identical. Each data base was designed to be compatible with the sampling and analysis methods specific to the medium that it covers, while retaining structural similarities with the other media for efficient cross-linking for multimedia sampling analysis reporting.

Each data base contains a cross-reference to those other data bases containing data from the same source at the same point in time. This cross-reference is in the form of a test series number (TSN). Thus, an SDDS file might contain the FPEIS, LEDS, and GEDS test series numbers as cross-references. In the same manner, test series in the other media might contain a cross-reference to the SDDS data base. A summary of the multimedia data currently found in the SDDS is given in Appendix A.

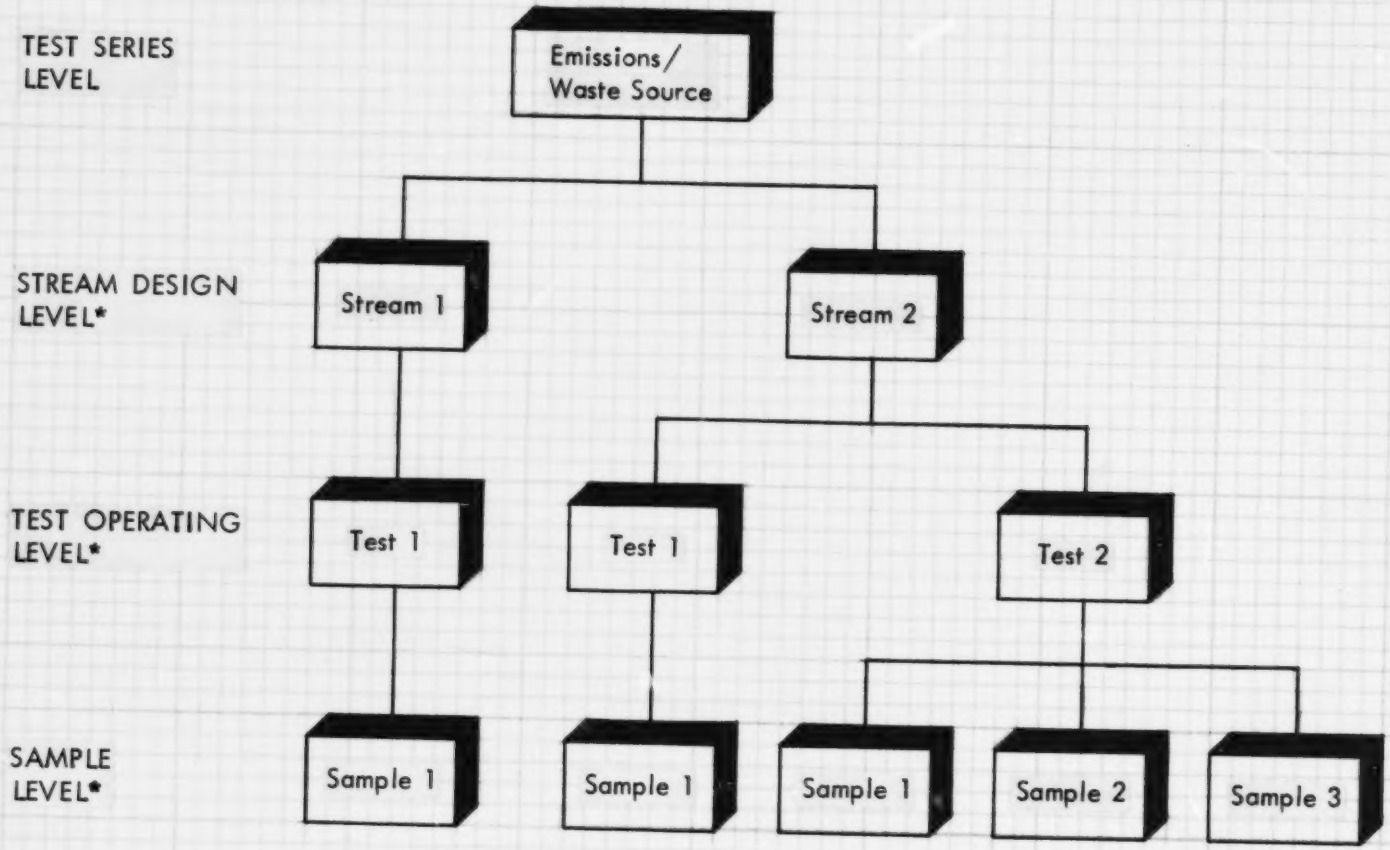
SDDS DESIGN

From an organizational standpoint, the SDDS data elements are grouped into four levels: the test series level, the stream design level, the test operating level, and the sample level. This structure is shown in Figure 2. The data elements are arranged with general information at the uppermost level to specific results found at the lowermost level.

The term test series level is used to designate the uppermost level data base structure. This is where source description data are contained. A test series describes the sampling activities performed at a single site over a specific period of time. Each test series is assigned a unique test series number which can always be used to identify those data.

Below the test series level is the stream design level. Here, each waste stream that has been sampled is fully described, including control device design parameters. As shown in Figure 2, a test series may have multiple streams, although for most SDDS sources only a single discharge stream is likely.

Below the stream design level is the test operating level. As the name implies, operating data for each test are defined here. Source process conditions, as well as operating mode and control device operating data, are reported. Fuels and feedstocks to the process are also completely characterized. A test is defined broadly as a set of various types of samples taken to characterize a solid waste stream under one set of source and



*Multiple Streams, Tests, and Samples indicated to show flexibility of EADS to handle multiples at these levels.

Figure 2. EADS/SDDS organization.

control device operating conditions. Again, from Figure 2, there may be multiple operating conditions of the source under which samples may be collected from the same stream.

The lowermost and most fundamental level of the data base is the sample level. This level describes the collection and subsequent analysis of each discrete sample collected, including measurement equipment particulars, measured stream conditions at the sampling location, and complete physical, chemical, radionuclide, and bioassay data.

This sample level contains a component feature that permits reporting with respect to a measurement instrument component. The EADS is designed to accommodate the data in any arrangement by allowing the components of the sampling method to be defined according to the needs of the test or analysis.

DATA BASE STRUCTURE

The major categories of data within each level of the data base are given in Figure 3. The data are grouped into the following general categories: general source description and related information; design conditions and parameters of the effluent stream and of the control device or treatment/storage/recovery process; test operating information including analysis of any fuels and feedstock; and sampling activities information including chemical, physical, radionuclide, and biological analysis results.

Source Descriptions

The EADS Source Classification System[3] provides standard terms to enable the general grouping of sources and to facilitate computer searches. In order to provide a cross-reference to other government data systems, the source description includes the Standard Industrial Classification (SIC)[4] code as defined by the U.S. Department of Commerce.

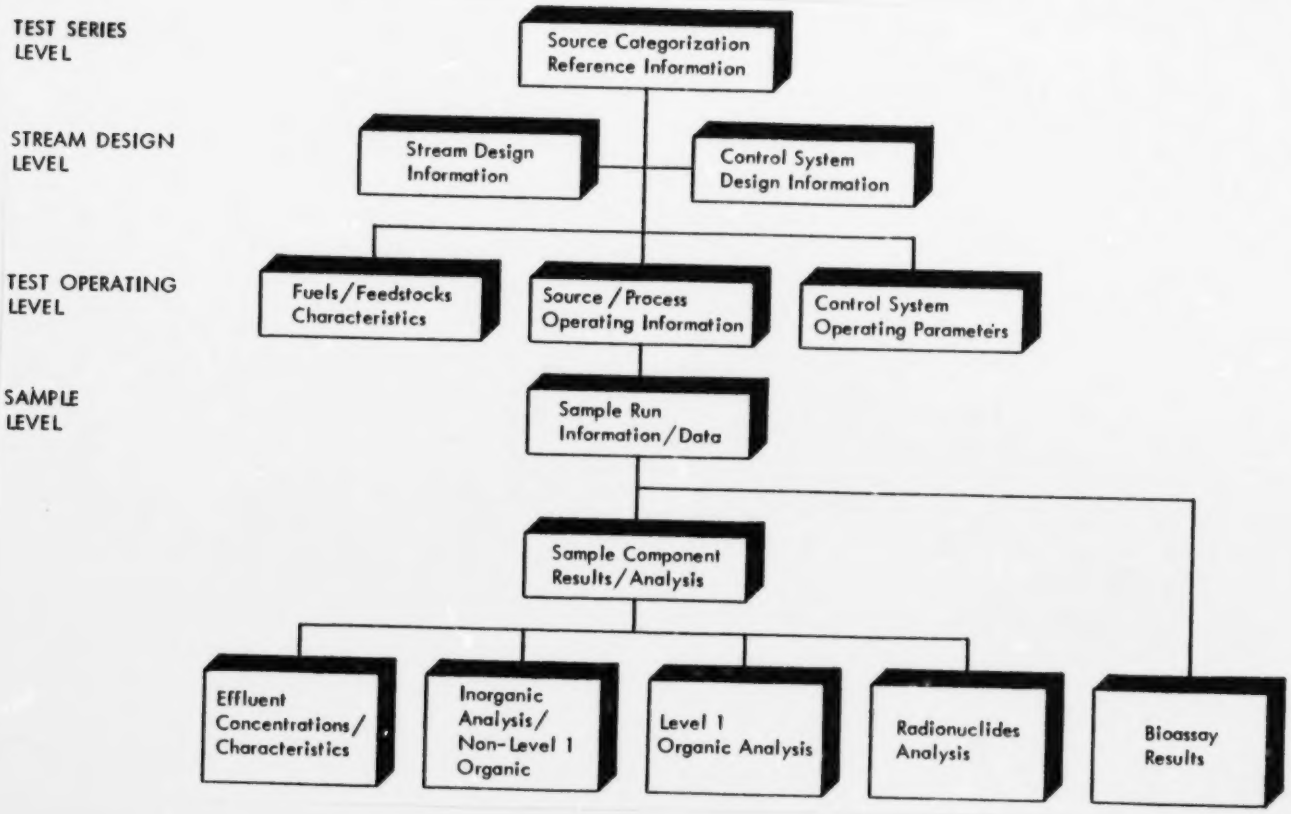


Figure 3. SDDS structure.

The name of the testing organization and the reference (report, journal article, etc.) from which the data have been extracted are included in this category. Additionally, comments or data may be included which may be pertinent to the test series but for which a specific data element is not available. An abstract of the test activity is included to provide a general description of the test series. Indications of the quality of the data are also contained at the test series level. This includes references to availability of test plans, and QA plans.

Stream Design Characteristics

The design conditions of the effluent stream at a sampling location are described at this category. For example, data on flow rate, temperature, and pressure may be repeated here. This design information should remain constant from test to test unless the control technology or stream itself is altered in some way.

Control Device Design Characteristics

This category contains design information and descriptions of any control or disposal technology for the test series. Information provided includes commercial name, manufacturer or other items to characterize the control technology. Available design parameters are included to provide additional characterization.

Test Identification

This category provides actual operating conditions of the source process and any control technology. The information includes test data and times and operating conditions of the source, such as plant output or amount of fuel used. Actual operating characteristics of the control technology, such as pressure drops, are provided.

Fuels and Feedstock Characteristics

This category includes data describing all fuels and feedstocks that are inputs to the process being tested. This can help to provide a comprehensive assessment of the material balances on a source. The EADS contains data on the consumption rate and type of fuel or feedstock and general characteristics such as physical parameters. In addition to an ultimate and proximate analysis of the fuels consumed in a process, EADS is aso designed to accept inorganic and organic chemical analysis data.

Sampling Activity Description

This category contains information that describes the individual sampling activity. Information about the sample method and activity is provided, including measurement instrument type and name, measurement flows, and temperatures. Actual stream conditions, as measured at the sampling location, can be provided. In addition, the sampling location itself can be described so that its location with respect to a single control or treatment process is clear, as well as its location with respect to a total system or group of control processes.

Component Description

Frequently, a measurement instrument or sample will contain two or more components, each of which is analyzed separately. This category is provided to describe each component individually and to report results obtained from the analysis on each component. Regardless of the number of components making up a measurement instrument or sample, this category describes the chemical, physical, biological, and radionuclide results available. Also, physical parameters such as opacity, odor or color can be described. A description follows of the type of analyses available in this category.

Inorganic/Nonlevel 1 or 2 Organic Analysis

The EADS is designed to accept all inorganic results and organic results that do not conform to Level 1 or 2 protocols[5]; that is, species-specific organic results. Results of the inorganic or Non-Level 1 or 2 analysis are typically presented as the identification of the species analyzed and the actual source concentration as contributed by each component.

The EADS recognizes the existence of a variety of coding systems for identifying chemical species and compounds. Users are able to use two chemical identification schemes, the Chemical Abstract Services (CAS) registration numbers, and the Multimedia Environmental Goals (MEG)[6] numbers.

Level 1 or 1 Organic Analysis

Level 1 or 2 organic analyses require special reporting formats due to the mix of qualitative and semiquantitative results from analyses such as liquid chromatography fractionation and low resolution mass spectroscopy (LRMS). The purpose of this type of analysis is to identify the major classes of organic compounds in a process effluent stream and to estimate their concentrations. Special provisions have been included to accommodate the organic species reporting protocol of a Level 1 or 2 environmental assessment sampling and analysis program. Gas chromatography data are also available under the Level 1 protocol.

Radionuclide Analysis

When available, the SDDS can accept and report radionuclide data results. Actual source concentrations of radionuclides are presented as picocuries per gram (pCi/g).

Bioassay

Biological indicators sometimes are coupled with chemical tests to assess more accurately the hazard potential of process effluent streams. The

Level 1 screening phase uses a series of short-term bioassays to detect acute biological effects. Bioassays may be either health related or ecology related. The SDDS reports results in terms of concentrations, mutagenicity and toxicity levels.

SECTION 3

DATA SUMMARY

The SDDS is the smallest in size of the four EADS waste stream data bases currently in operation. The principal reason for the small size is the general lack of solid waste data made available to the EADS. However, there is evidence that more sampling and analysis of solid waste streams is beginning. The increased concerns about hazardous waste and waste disposal and shift from air pollution to toxic and hazardous waste problems at the Federal and State levels indicates that further research and data generation concerning solid waste streams will be forthcoming. It is anticipated that the SDDS will undergo significant growth in 1983. Hazardous and toxic sampling typically involves either the liquid or solid media. A complete list of SDDS TSNs and the source identifiers now in the SDDS is given in Appendix B.

SDDS SOURCES SUMMARY

All of the SDDS data currently in the data base were collected from combustion sources. Coal was used as the fuel in all test series except four which used wood. Table 1 summarizes the sources reported. Fifteen utility boilers and six industrial boilers were tested. None of the test series reported have any specific treatment, recovery, or disposal system for the solid waste sampled.

All of the tests in the SDDS were a part of a multimedia environmental assessment. For example, a utility boiler was tested for air particles (FPEIS), gaseous content (GEDS), and bottom ash content (SDDS).

TABLE 1

PRINT-001

ENVIRONMENTAL ASSESSMENT DATA SYSTEMS
SOURCE CATEGORY SUMMARY

PAGE: 001
DATE: 04/27/83

DATA BASE: SDDS

WHERE CLAUSE FOLLOWS:
WH C355 LT 01/01/83

SOURCE CATEGORY	SOURCE TYPE	PRODUCT OR DEVICE	PROCESS TYPE	SIC	NUMBER OF TEST SERIES	NUMBER OF SAMPLES
COMBUST-ENERGY	INDUSTRIAL	BOILER	STOKER	4960	5	13
COMBUST-ENERGY	UTILITY	BOILER	CYCLONE	4911	2	4
COMBUST-ENERGY	UTILITY	BOILER	HORIZ OPPOSED WALL	4911	1	6
COMBUST-ENERGY	UTILITY	BOILER	SINGLE WALL	4911	7	17
COMBUST-ENERGY	UTILITY	BOILER	STOKER	4911	4	7
COMBUST-ENERGY	UTILITY	BOILER	TANGENTIAL	4911	1	4

CHEMICAL DATA SUMMARY

The primary data in the SDDS are chemical discharge information. This is most often from analysis of the solid waste produced by combustion (i.e., bottom ash, fly ash). Table 2 shows that 13 of the 128 water priority pollutants were found in the SDDS, and two organic compounds were reported. Table 3 shows that four of the pollutants designated as hazardous under the Resource Conservation and Recovery Act (RCRA) are reported. It should be noted that Tables 2 and 3 are the types of user programs available from the EADS Program Library. They demonstrate the way a user can retrieve and receive data in summary form. Other selection possibilities may include Section 311 hazardous pollutants, metals and pesticides, and NAAQS criteria pollutants. These routines are capable of providing the minimum, maximum, mean, median, and standard deviation of chemical pollutant concentrations for selected source category and control system combinations.

TABLE 2

STATS-001 ENVIRONMENTAL ASSESSMENT DATA SYSTEMS
CHEMICAL STATISTICS REPORT

PAGE: 001
DATE: 05/04/83

DATA BASE: SDDS SAMPLE LOCATION: I
EPA CHEMICAL LIST CODE: P WATER PRIORITY POLLUTANTS

WHERE CLAUSE FOLLOWS:
WH C355 LT 01/01/83

POLLUTANT PREFERRED NAME	NUMBER OF TEST SERIES	NUMBER OF SAMPLES	CHEMICAL POLLUTANT CONCENTRATION (UG/G) MINIMUM	MAXIMUM	MEAN	MEDIAN	STD DEV
ANTIMONY	5	8	6.000-01	1.500+01	4.880+00	7.800+00	4.539+00
ARSENIC	7	18	2.000+00	8.300+02	1.496+02	4.160+02	2.370+02
BERYLLIUM	7	15	1.800-01	1.100+01	3.327+00	5.590+00	3.361+00
CADMIUM	5	8	2.000-01	3.100+00	1.325+00	1.650+00	8.924-01
CHROMIUM	7	17	3.100+00	6.400+01	2.102+01	3.355+01	1.617+01
COPPER	7	17	1.600+00	1.500+02	4.905+01	7.580+01	4.286+01
LEAD	6	10	3.400+00	1.600+02	5.758+01	8.170+01	6.307+01
MERCURY	6	11	4.000-03	1.960+00	2.946-01	9.820-01	5.690-01
NAPHTHALENE	2	2	9.100-01	1.000+00	9.550-01	9.550-01	6.364-02
NICKEL	7	14	8.000+00	1.600+03	1.700+02	8.040+02	4.162+02
PHENANTHRENE	1	1	1.900-01	1.900-01	1.900-01	1.900-01	********
SELENIUM	4	7	1.000+00	1.900+01	5.471+00	1.000+01	6.236+00
ZINC	7	18	4.000+00	3.500+02	9.273+01	1.770+02	9.595+01

TABLE 3

STATS-001 ENVIRONMENTAL ASSESSMENT DATA SYSTEMS
CHEMICAL STATISTICS REPORT

PAGE: 001
DATE: 05/04/83

DATA BASE: SDDS SAMPLE LOCATION: I
EPA CHEMICAL LIST CODE: R RCRA HAZARDOUS WASTES

WHERE CLAUSE FOLLOWS:
WH C355 LT 01/01/83

POLLUTANT PREFERRED NAME	NUMBER OF TEST SERIES	NUMBER OF SAMPLES	CHEMICAL POLLUTANT CONCENTRATION (UG/G) MINIMUM	MAXIMUM	MEAN	MEDIAN	STD DEV
BERYLLIUM	7	15	1.800-01	1.100+01	3.327+00	5.590+00	3.361+00
FLUORINE	5	9	9.500+00	1.580+03	3.157+02	7.947+02	4.932+02
MERCURY	4	11	4.000-03	1.960+00	2.946-01	9.820-01	5.690-01
NAPHTHALENE	2	2	9.100-01	1.000+00	9.550-01	9.550-01	6.364-02

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APPENDIX A

ENVIRONMENTAL ASSESSMENT DATA SYSTEMS MULTIMEDIA REPORT FOR SDDS

The Multimedia Report identifies SDDS Test Series for which sampling and analysis data in other media were taken concurrently and also reported in companion EADS data bases. This summary identifies the true "multimedia" SDDS Test Series.

Test Series No.	Corresponding Multimedia Test Series Nos.		
	FPEIS	LEDS	GEDS
1	256	-	126
2	257	-	127
3	258	-	128
4	259	-	129
9	292	414	55
10	200	-	1
11	172	-	6
12	173	389	7
13	266	390	9
14	267	391	10
15	174	392	11
16	171	394	17
17	184	-	23
18	185	-	24
19	166	-	26
20	167	-	27
21	-	398	28
22	-	399	29
23	168	401	31
24	-	402	32
27	201	-	2

APPENDIX B

SOLID DISCHARGE DATA SYSTEM
TEST SERIES SOURCE
SUMMARY

PRINT-005

ENVIRONMENTAL ASSESSMENT DATA SYSTEMS
TEST SERIES SOURCE SUMMARY

DATA BASE: SDDS

WHERE CLAUSE FOLLOWS:
WH C355 LT 01/01/83

TEST SERIES NUMBER	SOURCE CATEGORY	SOURCE TYPE	PRODUCT/ DEVICE	PROCESS TYPE	FEED MATERIAL CATEGORY	NUMBER OF SAMPLES
00001	COMBUST-ENERGY	INDUSTRIAL	BOILER	STOKER	WOOD	1
00002	COMBUST-ENERGY	INDUSTRIAL	BOILER	STOKER	WOOD	2
00003	COMBUST-ENERGY	INDUSTRIAL	BOILER	STOKER	WOOD	3
00004	COMBUST-ENERGY	INDUSTRIAL	BOILER	STOKER	WOOD	1
00009	COMBUST-ENERGY	UTILITY	BOILER	HORIZ OPPOSED WALL	COAL	6
00010	COMBUST-ENERGY	INDUSTRIAL	BOILER	STOKER	COAL	6
00011	COMBUST-ENERGY	UTILITY	BOILER	SINGLE WALL	COAL	1
00012	COMBUST-ENERGY	UTILITY	BOILER	SINGLE WALL	COAL	1
00013	COMBUST-ENERGY	UTILITY	BOILER	SINGLE WALL	COAL	7
00014	COMBUST-ENERGY	UTILITY	BOILER	TANGENTIAL	COAL	4
00015	COMBUST-ENERGY	UTILITY	BOILER	SINGLE WALL	COAL	2
00016	COMBUST-ENERGY	UTILITY	BOILER	CYCLONE	COAL	2
00017	COMBUST-ENERGY	UTILITY	BOILER	STOKER	COAL	2
00018	COMBUST-ENERGY	UTILITY	BOILER	STOKER	COAL	1
00019	COMBUST-ENERGY	UTILITY	BOILER	SINGLE WALL	COAL	2
00020	COMBUST-ENERGY	UTILITY	BOILER	SINGLE WALL	COAL	2
00021	COMBUST-ENERGY	UTILITY	BOILER	SINGLE WALL	COAL	2
00022	COMBUST-ENERGY	UTILITY	BOILER	CYCLONE	COAL	2
00023	COMBUST-ENERGY	UTILITY	BOILER	STOKER	COAL	2
00024	COMBUST-ENERGY	UTILITY	BOILER	STOKER	COAL	2